

SKIN PRODUCTS.

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IT requires little more than simple inspection to reveal the fact that the human body, like that of bird or quadruped, consists of a frame covered by a kind of double sack, the skin and the intestines. Take a rough example: When a butcher dresses a sheep, he pulls off the one and pulls out the other. One is the tegument or outer covering, the other the intestinal or inner lining. Stripped of these two skin tissues, the lining and the covering, there remain the flesh and blood and bone constituting the animal frame. One of these sacks is the cutaneous tissue with its epidermis, the other the mucous membrane with its epithelium. Apart from its fibrous base the double sack, between the two portions of which the organism grows, consists of epidermis without and epithelium within, called by morphologists the skin sensory layer and the intestinal glandular layer;* between these two is the double fibrous layer of flesh and blood.

In lowest organisms the covering and lining, ectoderm and endoderm, constitute the whole being. In embryology the covering and lining are called epiblast and hypoblast. Between the sack covering and the sack lining, ectoderm and endoderm, lies the mesoderm, which is the gross construction of the body, the skeleton with its muscular tissue about it, and its sanguiferous trunk within. It is plain to be seen how perfectly the vertebral column with its enclosing ribs embraces and holds that "light ramified tree," the circulatory system, and how upon its exterior it bears the powerful muscular masses and long limbs.

* Haeckel, "Anthropogenie."

As the organism develops, and while the mesoderm or gross construction is differentiating into skeleton, vascular system and muscular system, what progress is taking place in the covering and lining? Both embryology and comparative anatomy* show that cutaneous tissue and mucous membrane, ectoderm and endoderm, are the seat of extraordinary operations; that here are exhibited extremely singular processes, such processes being the various forms of inversion which these membranes undergo. Over the surface small depressions appear, which, sinking deeper, become pits, crypts or follicles, become inversions or invaginations or pouches. At first one would hardly think of identifying them with glands, much less with ganglions.

A kind of pouch-making process seems to prevail all over the body, inside and out, wherever the skin covering or lining with its extraordinary epidermis or epithelium is found. We know that in vertebrates the lungs and the liver and the urinary bladder are such pouches, inversions of the mucous membrane (endoderm, intestinal glandular layer). We know that the trachea of insects are inversions of the outer skin and their nitrogenous excretory organs are inversions of the intestine.† We know that in man the sweat glands, the lacrymal glands, the sebaceous glands, the cerumenous glands, and the mammæ, are all pouches or inversions of the outer skin.

Now comes the curious part of the teaching. That the liver, the lungs, or even the ovarium, should prove to be intestinal inversions seems not surprising; but when we find also that upon the outer skin appear depressions that are called eye spots and retina and ear vesicles and brain bladders, and that these are simply cutaneous inversions, amazement begins; yet such is the fact. The single urinary bladder of the body is an intestinal inversion, the double air bladders or pair of air bladders which become lungs are

* Balfour, *Comparative Embryology*; Wiedersheim, *Comparative Anatomy of Vertebrates*--two invaluable works.

† Jeffry Bell, *Comparative Anatomy and Physiology*. Also Balfour, *Comp. Embryol.*

intestinal inversions lined with epithelium; the five brain bladders are simply cutaneous inversions lined with their epithelium.*

This then is the truth that science has forced upon us; that the eye and the ear in their essential parts and the brain itself are pouch-like inversions of the ectoderm, as the lungs, the liver and the ovarum, etc., are all pouches or inversions of the endoderm. The kidneys and testes are of precisely similar origin, dermal inversions or pouches, either in lining or covering.†

While kidneys, testes and ovaries at one extremity of the organism are lined or made up of secreting and germinating epithelium, the retina, the internal ear, and the fore brain at the other extremity are lined with sensory and reflecting epithelium. The skin follicles, the organs of sense and the brain, are part of the outer skin series of inversions; the mucous follicles, the great glands and possibly the ovarum, part of the inner skin series.

Epidermis and epithelium, outer covering and inner lining are united in one. The inner skin is but a continuation of the outer, subject to different conditions, darkness and moisture instead of light and the shocks of the environment. From recent anatomy and embryology it may be laid down that the human organism, and every other consists of two parts, a frame and a skin. Even a tree or plant consists of these two essential parts, the wood or trunk, fibre, and the outer bark or parenchyme; an animal being double, tube formed instead of rod formed, has its frame or gross construction compound, and its bark or skin is continued down into the tube, forming a lining.

In both organisms is seen a kind of unit or life of the frame, a gross or crude life, and a unit or life of the skin—a culminating or refined life. The skin of a small plant, if examined, seems to culminate in leaves and flowers; the skin of the vegetative or internal part of a small animal,

* Haeckel, "Anthropogenie." Balfour, "Comparative Embryology."

† The kidneys certainly of cutaneous origin; that of the testes disputed. Balfour gives bibliography. In the vertebrate embryo testes and ovaries seem to be connected with the mesoderm. The germ glands cannot be called inversions.

i. e., the mucous membrane, seems to culminate in these inversions—lungs, kidneys, and genitals, glandular inversions giving rise to gaseous and liquid products and ponderable forms or germs; while the skin of animal life seems to culminate in the organs of special sense and the brain bladders, ganglionic inversions producing color and vibration, light and shadow and phosphorescence, imponderable forms or spectra.

This greater skin, cutaneous and mucous, with all its involutions, constitutes a vast field of varied and wonderful products. The inner tract is covered with thick-set columnar epithelium, living and moving like a field of waving grain. This membrane produces first a protective mucus and various juices—œsophageal juice, gastric juice, intestinal juice; while the outer tract produces sweat and oil, its epithelium perpetually exuviating, and bringing forth no longer soft mucus but hardened horn and hair. Both the inner and outer field invert into glands producing strange substances—the ferment of saliva, the brine of tears, the bitter of gall, the nourishment of milk, and the formed eggs and semen, the highest inner product being these material germs.

On the outer and partly the inner field are the inversions of the taste bulbs, the olfactory epithelium of the nasal membrane, the retinal rod and cone epithelium, the vibrating epithelium of the ear, and the pyramidal epithelium of the cerebral cortex* where etherial or phosphorescent germs are found, shadows or spectra gathering in clusters and forming not ponderable embryos but imponderable spectra or "ideals." Cerebral shadows or spectra are the highest outer-skin products, as the material germs are the highest inner-skin products. The embryo created on the interior is semi-fluid and ponderable like the organism itself; the ideal or spectra created on the exterior is flitting and imponderable, it is, as it were, the shadow of the organism.

Of an indifferent sculptor with very handsome children, Michael Angelo said that he made better work by night

* The gray matter of the brain is the original epithelium lining the cutaneous in version. See paper by George Jacoby in the Medical Journal, May, 1888.

than he did by day. The inner-skin products were better than the outer-skin products.

Man consists of a frame and a skin. The frame is the skeleton with the muscular and sanguiferous systems; the skin is the highly involuted covering and lining of the frame. The function of the frame is to support and to nourish; the function of the skin throughout is production. Physicians and surgeons in ordinary deal with the human frame; gynæcologists, dermatologists, alienists, and neurologists deal with the human skin and its products. In this view, everything about the organism that is not muscle or bone or blood or aliment is skin or skin product, and it is the greater skin, the whole skin—cutaneous, mucous, and serous,—which is the common basis upon which these four specialists may be said to stand.

Skin products are the results of the thousand epithelial inversions and exuviations, and are solid or liquid or gaseous or viscid, are vaporous or etherial, are formed or unformed. Breath and the cutaneous exhalations are gaseous, or gaseous and vaporous; tears, urine, bile, and milk are fluid; mucus saliva, sebum, cerumen, are viscid or semi-solid; hair and horn are solid and formed products; eggs and ova are viscid and formed; tastes and smells, sounds and spectra, are gaseous, vaporous, or etherial, and tend to be formed products.

Important products of the skin of the vegetative life in man are gaseous or viscid—the breath from the lungs, the ova and sperm from the genital glands. Important products from the skin of animal life in man are solid or etherial—hair and horn on the one hand, sensations and reflections from the sensory and ganglionic inversions on the other. The products of the skin of vegetative life are nearly as mysterious as those from the skin of animal life; an ovum or a spermatozoön is visible and tangible, can be measured and weighed; a breath cannot ordinarily be seen, but may be smelt and felt, can with difficulty be measured and weighed, and is the theme of the poet. Of the products of the animal life, a horn, a hair, a tooth, or a nail is solidly visible and tangible, measurable and ponderable; a sound,

an odor, a taste, or a color or spectrum* can hardly be weighed, but may be measured.—These are only one kind, and the highest kind, of skin products.

When, a hundred years ago, it was announced that the brain secreted thought as the liver secreted bile, the crudeness of the doctrine produced a shock ; but it seems proved by the comparative anatomy and the comparative embryology of to-day that the skin, by its ectodermal inversions, produces, with its ganglionic epithelium the medullary-plate, the elements of thought, vibrations, and spectra, or sensations and reflections, in a way analagous to that in which the more superficial horn-plate brings forth hair, nails, and teeth, and in which the glandular inversions of the inner skin produce mucus and exhalations, and in which the terminal germ tissue brings forth germs.

Concentrate our attention for a moment on the two foci of the organism. The spermatic and ovarian germs are the elements of a new organism, that new and mysterious, but material man, the embryo. Sensations are the elements of the image, or ideal, the cerebral born man. The optic spectrum gives this shadow man a form, and the auricular vibration gives it a voice ; taste, smell, and touch, and voluptuousness may all add their quota to make the sweet (or terrible) illusion, the shadow man or homunculus more real. That the shadow man can come out of its cerebral womb, and materialize and talk, is a matter of every-day observation. It is materialized in marble or paint ; it talks in a book or periodical. No greater wonder need be sought ; the truly wonderful lies in nature. Science with its research will show still greater wonders when it shall prove, as seems now likely, that sensations, emotions, and reflections are produced by the inverted epithelium—when it shows that ideals and phantasms, spectres and goblins and faries, spirits of good and spirits of evil, angels and demons, the goddesses and the gods, are like teeth and hair, like breath and saliva, like tears and like sweat, like the egg and like seed, and like the embryo, pure, simple, and natural skin products.

* To see a spectrum, look steadily at the sun an instant, then close the eyes tightly.